BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

UNFULFILLED OBJECTIVES

Title Guide to the Costing of Water from Nuclear Desalination Plants

Publisher International Atomic Energy Agency, 1967

Pages 84 (43 figures)

Price $2.00

Reviewer W. Kenneth Davis

The overall impression left by review of this report is that this document is a worthwhile contribution to the desalination literature, but not for its stated objectives. The introduction states that the intent is to provide a means of obtaining "preliminary but realistic estimates" of desalted water utilizing nuclear energy. In addition, the comment is made that "a community can at least decide whether or not it is worthwhile embarking on the relatively costly business of preparing a detailed study for their own particular needs."

In our opinion, the report should not in general be used for these objectives. Instead, it is worthwhile to cover a very large amount of material and, chiefly for that reason, many simplifying assumptions were made. It would probably have been preferable to limit the report in scope, particularly with respect to reactor type and water plant upper brine temperature.

With these and other limits in scope, more time might have been spent in 1) obtaining more definitive cost data, 2) applying alternative power/water cost allocation techniques, and 3) simplifying the report content.

The report does contain a large amount of technical information on nuclear desalination and the effects of the many variables. For this reason, it will be useful to those wishing to further their knowledge in this important field.

In summary, the report attempts reading for those wishing an introduction to dual-purpose plant economics and plant design. Some specific observations follow on the report's limitations.

Allocation of water and power costs in a dual-purpose desalting/power generating facility is subject to many different computational procedures, as the report points out. Therefore, the use by the report of one, entirely arbitrary, cost allocation method would not lead the user to the conclusion that he has obtained a "preliminary but realistic" cost for any community. This selection of cost allocation procedures is highly important and should itself be one of the subjects of a preliminary cost investigation.

With respect to nuclear equipment, the basic ground rules do not emphasize the important differences between the various kinds of nuclear reactors that were considered. These items include relative steam flows, cycle efficiencies, effect of pressure and temperature on reactor cost, and availability of a particular reactor type. On this last point, it is misleading to imply the general availability of fast breeder reactors.

Many assumptions made are so approximate as to cast considerable doubt on the accuracy of the stated nuclear steam costs. For example, the report assumes that the feed-water temperature is the same for both high- and low-temperature steam cycles, a gross assumption. On the other hand, very detailed items, such as the assumption of a 0.2% heat loss in the feed-water heaters, involve much greater accuracy than is actually available. In general, the report attempts to place high- and low-temperature systems on an equivalent basis, which is not a valid technique. Capital costs for both nuclear and desalting equipment are very approximate. It is misleading to suggest the general applicability of these data.

The step-by-step procedure for computing water and power costs is cumbersome. The rather extreme detail of this procedure seems inconsistent with the level of accuracy of the cost data. Incidentally, the placing of the basic computational procedure at the end of the report, with a minimum of explanatory information, does not make for ease of use of the document.

W. Kenneth Davis is Vice President of Bechtel Corporation. As former head of Bechtel's Scientific Development Department, he was responsible for development and advanced engineering in nuclear, saline water conversion, space, and other scientific fields. He also has been in charge of a number of new reactor projects, including the Fast Reactor Test Facility for Argonne National Laboratory; the Tarapur, India, power station; the Tecnatom S.A. power plant for UEM, Spain; and the

Nuclear Fuel Services fuel reprocessing plant near Buffalo, New York. He gained seawater conversion experience on such Bechtel projects as the Southern California Metropolitan Water District's study of a nuclear power desalting plant, analyses conducted for the OSW and USAEC on large nuclear-saline water conversion plants, and other sponsored studies for the development of water conversion process materials technology and facility designs. Before joining Bechtel in 1958, Mr. Davis was the Director of the USAEC Reactor Development Division.

OUTSTANDING COVERAGE

Title Scientific Satellites

Author William R. Corliss

Publisher U.S. Government Printing Office, 1967

Pages vii + 822

Price $3.00

Reviewer William C. Bartley

The objective of this book on unmanned scientific satellites and the scientific experiments they carry is, according to the Foreword, to record the development of space equipment and instrumentation, and thus to provide a ready reference on how scientific results have been obtained. The result is a useful earth-satellite encyclopedia for the layman, a condensed handbook for the spacecraft engineer, and a refresher course for the space scientist in measurement techniques outside his discipline.

The book is divided into three parts. The first contains two chapters: a thumbnail review of near-earth space science and its objectives, and a very readable capsule history of scientific satellites. The first chapter, in addition to providing the nonscientist with an overall perspective of earth physics research, lists the principal competing arguments for unmanned automated vs manned spacecraft for scientific investigations. Unlike many documents that describe space exploration in a monotone of unrelieved facts and figures, this volume is written in an empathic style that generates in the reader enthusiasm for the subject. The second chapter is an excitingly told story of satellite concepts beginning with Hale's "Brick Moon" of 1870.

The second part is a seven-chapter handbook on satellite technology: construction, dynamics, data handling, launch vehicles, and the like. It outlines the technical phases of feasibility, design, and integration, and leads to an appreciation of the magnitude of effort and time required from inception to launch for the development of a spacecraft.

Comprising Part Three are four chapters describing satellite experiments in physics and astronomy and one chapter on unmanned satellite biology and bioastronautics. The components and physical theory of ~100 representative instruments are described in understandable terms. The reviewer will comment only on the treatment of cosmic ray instruments, the field in which he is most qualified.

Under "Satellite Astronomy" the author describes the basic geometry and operation of these instruments with some thoroughness but is more ambiguous in describing total experiment details. For example, he lists *direction of arrival* as a major parameter and mentions earlier, under "Solar Physics," how one measures cosmic-ray anisotropies. Not explained is how a typical telescope array on a spin-stabilized spacecraft can accurately resolve anisotropies using a sun-synchronous computer. In general, this section of the book omits signal conditioning techniques, which are critical ingredients in the design of many experiments.

Because of the large amount of material to be covered, explanations of physical phenomena are overly simplified and hence some incorrect statements appear, e.g., ". . . galactic cosmic rays are omnidirectional, and moderated only when a tongue of solar plasma diverts them away from the Earth (Forbush decrease)." Actually, galactic particles are anisotropic (directional) to varying degrees, depending upon their energies, due to co-rotation of the cosmic rays with the sun—the cause of the well-known diurnal variations in cosmic rays seen at the earth's surface. These are subtle points, however.

The book is well organized and free of typographic error. An alphabetized bibliography for each chapter and an index appear at the end of the book. Appended is a comprehensive catalog of virtually all unclassified unmanned scientific satellites and experiments flown since 1957, complete with sketches and photos.

Naturally the treatment is superficial, but of the many reference works on scientific spacecraft available today, this one is outstanding for its overall coverage.

William C. Bartley is a scientific co-investigator with K. G. McCracken on cosmic-ray experiments for seven NASA flights: Pioneer deep space probes VI, VII, VIII, D, and E, and Explorer satellites XXXIV and IMP-G. With BS and MS degrees in electrical engineering from Michigan State University, he moved up through circuit and systems design to a management position in the integrated circuits group at Texas Instruments before joining in 1963 the Southwest Center for Advanced Studies, Dallas, where he set up a cosmic-ray spacecraft payloads development group. He was manager of that group until joining the National Academy of Sciences, Washington, D.C., in 1967. He is currently active in the work of the Space Science Board and the Committee on Solar-Terrestrial Research.

BOOK ANNOUNCEMENTS

Although the following will not be reviewed, they may be of interest to some of our readers:

Space Systems Technology, Regis D. Heitchue, Jr., Ed., Reinhold Book Corporation, 1968, x + 300 pp, $15.00

Proceedings of the Sixth Symposium on Nondestructive Evaluation of Aerospace and Weapons Systems Components and Materials, Southwest Research Institute and Society for Nondestructive Testing, Inc., Co-sponsors, Western Periodicals, 1967, viii + 575 pp, $20.00